



## TFT LCD Preliminary Specification

# MODEL NO.: V470H2 – PH1

Customer: \_\_\_\_\_

Approved by: \_\_\_\_\_

Note:

|             |                                       |  |
|-------------|---------------------------------------|--|
| Approved By | TV Product Marketing & Management Div |  |
|             | Chao-Chun Chung                       |  |

|             |               |                          |
|-------------|---------------|--------------------------|
| Reviewed By | QA Dept.      | Product Development Div. |
|             | Hsin-Nan Chen | WT Lin                   |

|             |                                              |         |
|-------------|----------------------------------------------|---------|
| Prepared By | LCD TV Marketing and Product Management Div. |         |
|             | CY Chang                                     | TC Chao |

## CONTENTS

|                                                                          |    |
|--------------------------------------------------------------------------|----|
| REVISION HISTORY.....                                                    | 4  |
| 1. GENERAL DESCRIPTION.....                                              | 5  |
| 1.1 OVERVIEW .....                                                       | 5  |
| 1.2 FEATURES.....                                                        | 5  |
| 1.3 MECHANICAL SPECIFICATIONS.....                                       | 5  |
| 2. ABSOLUTE MAXIMUM RATINGS .....                                        | 6  |
| 2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASE ON CMO MODULE V470H2-PH1)..... | 6  |
| 2.2 PACKAGE STORAGE.....                                                 | 7  |
| 2.3 ELECTRICAL ABSOLUTE RATINGS .....                                    | 7  |
| 2.3.1 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL) .....                      | 7  |
| 3. ELECTRICAL CHARACTERISTICS .....                                      | 8  |
| 3.1 TFT LCD MODULE .....                                                 | 8  |
| 3.2 RSDS CHARACTERISTICS .....                                           | 8  |
| Note (3) $V_{CMRSDS} = 1.2V(V_{DDD} = 3.3V)$ .....                       | 8  |
| 4. BLOCK DIAGRAM OF INTERFACE .....                                      | 9  |
| 4.1 TFT LCD MODULE .....                                                 | 9  |
| 5. INPUT TERMINAL PIN ASSIGNMENT.....                                    | 10 |
| 5.1 TFT LCD Module Input.....                                            | 10 |
| 6. OPTICAL CHARACTERISTICS .....                                         | 12 |
| 6.1 TEST CONDITIONS.....                                                 | 12 |
| 6.2 OPTICAL SPECIFICATIONS .....                                         | 12 |
| 7. PRECAUTIONS.....                                                      | 15 |
| 7.1 ASSEMBLY AND HANDLING PRECAUTIONS .....                              | 15 |
| 7.2 SAFETY PRECAUTIONS .....                                             | 15 |
| 8. DEFINITION OF LABELS.....                                             | 16 |
| 8.1 OPEN CELL LABEL .....                                                | 16 |
| 8.2 CARTON LABEL .....                                                   | 16 |



**CHI MEI**  
OPTOELECTRONICS CORP.

Issue Date: Jul.21.2009  
Model No.: V470H2-PH1

**Preliminary**

|                                      |    |
|--------------------------------------|----|
| 9. Packaging .....                   | 17 |
| 10. MECHANICAL CHARACTERISTICS ..... | 19 |

[www.panelook.com](http://www.panelook.com)



## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V470H2-PH1 is a 47" TFT Liquid Crystal Display module with driver ICs and 2ch-LVDS interface. This product supports 1920 x 1080 Full HDTV format and can display true 1.07G colors (10-bit/color). The backlight unit is not built-in.

### 1.2 FEATURES

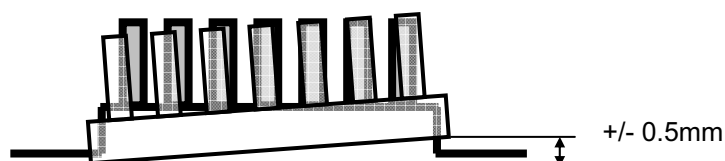
| CHARACTERISTICS ITEMS             | SPECIFICATIONS                                                                                                                        |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Screen Diagonal [in]              | 47"                                                                                                                                   |
| Pixels [lines]                    | 1920 × 1080                                                                                                                           |
| Active Area [mm]                  | 1039.68 (H) x584.82 (V) (47" diagonal)                                                                                                |
| Sub-Pixel Pitch [mm]              | 0.5405(V) ×0.1805(H)                                                                                                                  |
| Pixel Arrangement                 | RGB vertical stripe                                                                                                                   |
| Weight [g]                        | 2560                                                                                                                                  |
| Physical Size [mm]                | 1059.78(W) × 605.87(H) × 1.80(D) Typ.                                                                                                 |
| Display Mode                      | Transmissive mode / Normally black                                                                                                    |
| Contrast Ratio                    | 4000:1 Typ.<br>(Typical value measure at CMO's module)                                                                                |
| Glass thickness (Array / CF) [mm] | 0.7 / 0.7                                                                                                                             |
| Viewing Angle (CR>20)             | +88/-88(H), +88/-88(V) Typ. (CR ≥ 20)<br>(Typical value measure at CMO's module)                                                      |
| Color Chromaticity                | R = (0.652, 0.327)<br>G = (0.274, 0.588)<br>B = (0.150, 0.086)<br>W= (0.307, 0.318)<br>* Please refer to "color chromaticity" on p.14 |
| Cell Transparency [%]             | 4.5%                                                                                                                                  |
| Polarizer Surface Treatment       | Anti-Glare coating (Haze 11%), Hard coating (3H)                                                                                      |

### 1.3 MECHANICAL SPECIFICATIONS

| Item                            | Min.                                                                                                           | Typ. | Max. | Unit | Note |
|---------------------------------|----------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Weight                          | 2510                                                                                                           | 2560 | 2610 | g    | -    |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within $\pm 0.5\text{mm}$ as the horizontal. |      |      |      | (2)  |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASE ON CMO MODULE V470H2-PH1)

| Item                          | Symbol | Value |      | Unit | Note     |
|-------------------------------|--------|-------|------|------|----------|
|                               |        | Min.  | Max. |      |          |
| Storage Temperature           | TST    | -20   | +60  | °C   | (1)      |
| Operating Ambient Temperature | TOP    | 0     | 50   | °C   | (1), (2) |
| Shock (Non-Operating)         | SNOP   | -     | 50   | G    | (3), (5) |
| Vibration (Non-Operating)     | VNOP   | -     | 1.0  | G    | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ( $T_a \leq 40\text{ }^{\circ}\text{C}$ ).

(b) Wet-bulb temperature should be 39 °C Max. ( $T_a > 40\text{ }^{\circ}\text{C}$ ).

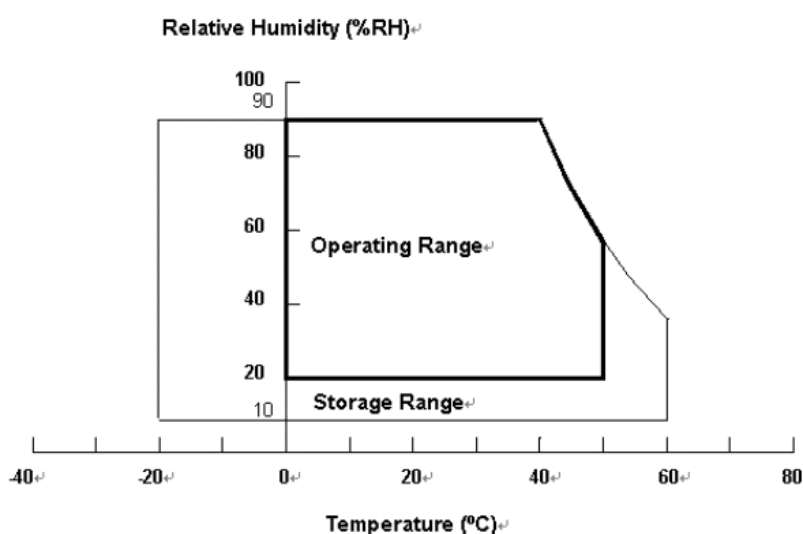
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for  $\pm X$ ,  $\pm Y$ ,  $\pm Z$ .

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.





## 2.2 PACKAGE STORAGE

Storage condition: With shipping package.

Storage temperature rang:  $25\pm 5^{\circ}\text{C}$

Storage humidity range:  $50\pm 10\%\text{RH}$

Shelf life: a month

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

| Item                 | Symbol   | Value |       | Value | Note |
|----------------------|----------|-------|-------|-------|------|
|                      |          | Min.  | Min.  |       |      |
| Power Supply Voltage | $V_{AA}$ | -0.5  | +18   | V     | (1)  |
| Power Supply Voltage | $V_{GH}$ | -0.3  | +32.3 | V     |      |
| Power Supply Voltage | $V_{GL}$ | -5.7  | -0.3  | V     |      |
| Logic Input Voltage  | $V_{DD}$ | -0.3  | +3.4  | V     |      |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

**3. ELECTRICAL CHARACTERISTICS****3.1 TFT LCD MODULE**

(Ta = 25 ± 2 °C)

| Parameter            |                              | Symbol           | Value |       |       | Unit | Note |
|----------------------|------------------------------|------------------|-------|-------|-------|------|------|
|                      |                              |                  | Min.  | Typ.  | Max.  |      |      |
| Power Supply Voltage |                              | V <sub>GH</sub>  | 31    | 32    | 33    | V    |      |
|                      |                              | V <sub>GL</sub>  | -5.8  | -5.5  | -5.2  | V    |      |
|                      |                              | V <sub>AA</sub>  | 17.4  | 17.7  | 18    | V    |      |
|                      |                              | V <sub>DD</sub>  | 3.2   | 3.3   | 3.4   | V    |      |
|                      |                              | V <sub>REF</sub> | 16.85 | 17.00 | 17.15 | V    |      |
| Power Supply Current |                              | I <sub>GH</sub>  | -     | 27.5  | 50    | mA   |      |
|                      |                              | I <sub>GL</sub>  | -     | 7     | 50    | mA   |      |
|                      |                              | I <sub>AA</sub>  | -     | 1.26  | -     | A    |      |
|                      |                              | I <sub>DD</sub>  | -     | 270   | -     | A    |      |
| CMOS interface       | Input High Threshold Voltage | V <sub>IH</sub>  | 2.7   | -     | 3.3   | V    |      |
|                      | Input Low Threshold Voltage  | V <sub>IL</sub>  | 0     | -     | 0.7   | V    |      |

Note (1) The module should be always operated within the above ranges.

**3.2 RSDS CHARACTERISTICS**

VDDD=3.0 to 3.6V, VDAA=13.5 to 18.0V, VSSD=VSSA=0V, Ta = -20~+85 °C

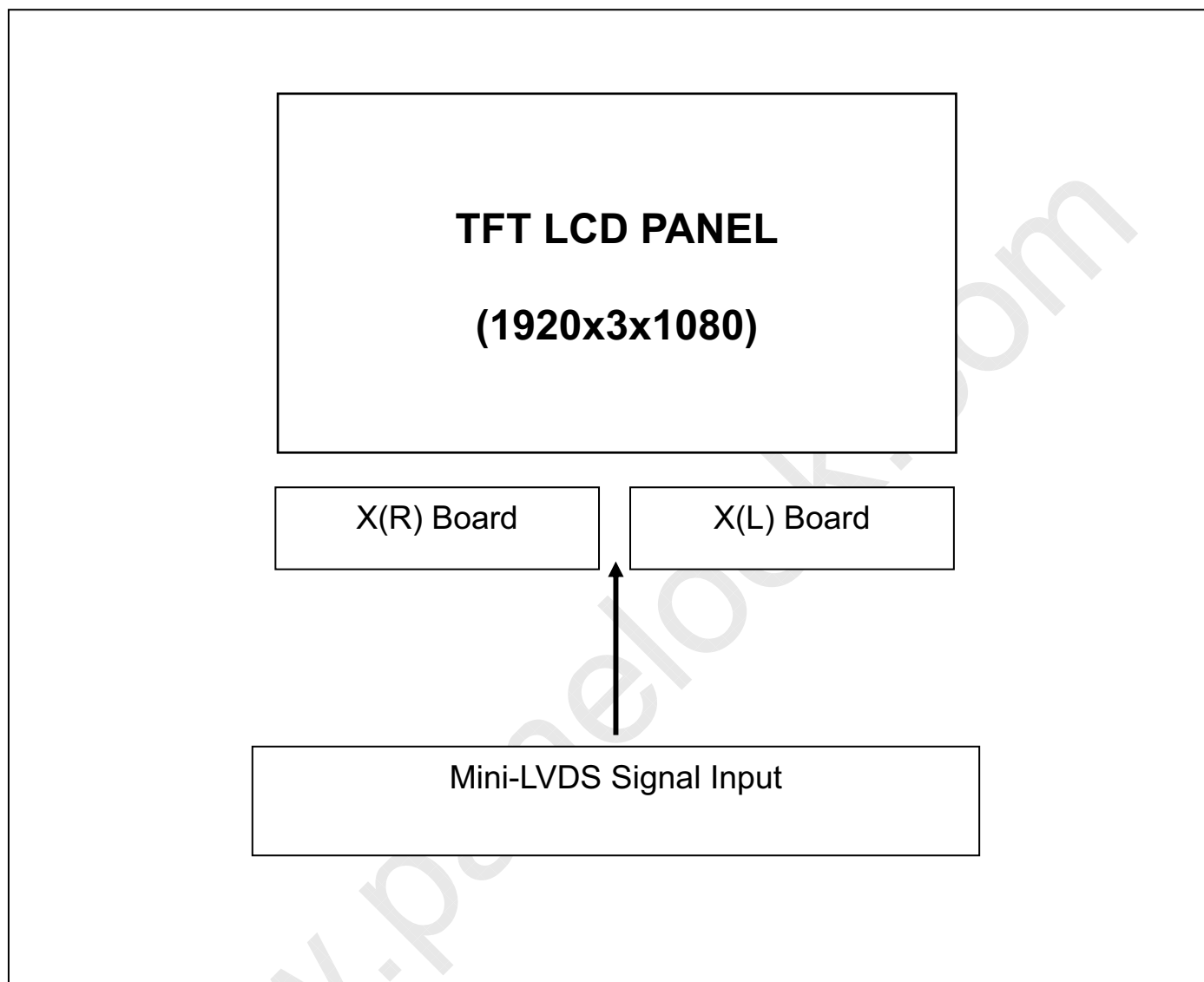
| Item                                 | Symbol                | Condition                          | Value    |         |          | Unit |
|--------------------------------------|-----------------------|------------------------------------|----------|---------|----------|------|
|                                      |                       |                                    | Min      | Typ     | Max      |      |
| RSDS high input Voltage              | V <sub>DIFFRSDS</sub> | V <sub>CMRSDS</sub> = +1.2 V (1)   | 100      | 200     | 600      | mV   |
| RSDS low input Voltage               | V <sub>DIFFRSDS</sub> | V <sub>CMRSDS</sub> = +1.2 V (1)   | -600     | -200    | -100     |      |
| RSDS common mode input voltage range | V <sub>CMRSDS</sub>   | V <sub>DIFFRSDS</sub> = 200 mV (2) | VSSD+0.5 | Note(3) | VDDD-1.2 | V    |
| RSDS Input leakage current           | I <sub>DL</sub>       | A/BDxxP, A/BDxxN, A/BCLKP, A/BCLKN | -10      | -       | 10       | μA   |

Note (1) V<sub>CMRSDS</sub> = (VCLKP + VCLKN)/2 or V<sub>CMRSDS</sub> = (VD<sub>xx</sub>P + VD<sub>xx</sub>N)/2Note (2) V<sub>DIFFRSDS</sub> = VCLKP - VCLKN or V<sub>DIFFRSDS</sub> = VD<sub>xx</sub>P - VD<sub>xx</sub>NNote (3) V<sub>CMRSDS</sub> = 1.2V(VDDD = 3.3V)



#### 4. BLOCK DIAGRAM OF INTERFACE

##### 4.1 TFT LCD MODULE





## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

#### CN1(XL) Connector Pin Assignment

| Pin No. | Symbol | Description              | Pin No. | Symbol | Description                 |
|---------|--------|--------------------------|---------|--------|-----------------------------|
| 1       | GND    | Ground                   | 41      | AD0M_1 | A-Path RSDS data signal     |
| 2       | BD1P_4 | Data driver clock        | 42      | GND    | Ground                      |
| 3       | BD1M_4 | Data driver clock        | 43      | GM20   | Gamma Power supply          |
| 4       | GND    | Ground                   | 44      | N.C.   | No connection               |
| 5       | B_CLKP | Data driver clock        | 45      | GM18   | Gamma Power supply          |
| 6       | B_CLKM | Data driver clock        | 46      | GM17   | Gamma Power supply          |
| 7       | GND    | Ground                   | 47      | GM16   | Gamma Power supply          |
| 8       | BD0P_4 | B-Path RSDS data signal  | 48      | GM15   | Gamma Power supply          |
| 9       | BD0M_4 | B-Path RSDS data signal  | 49      | GM14   | Gamma Power supply          |
| 10      | AD1P_4 | A-Path RSDS data signal  | 50      | GM13   | Gamma Power supply          |
| 11      | AD1M_4 | A-Path RSDS data signal  | 51      | GM12   | Gamma Power supply          |
| 12      | AD0P_4 | A-Path RSDS data signal  | 52      | GM11   | Gamma Power supply          |
| 13      | AD0M_4 | A-Path RSDS data signal  | 53      | GM10   | Gamma Power supply          |
| 14      | BD1P_3 | B-Path RSDS data signal  | 54      | GM9    | Gamma Power supply          |
| 15      | BD1M_3 | B-Path RSDS data signal  | 55      | GM8    | Gamma Power supply          |
| 16      | BD0P_3 | B-Path RSDS data signal  | 56      | GM7    | Gamma Power supply          |
| 17      | BD0M_3 | B-Path RSDS data signal  | 57      | GM6    | Gamma Power supply          |
| 18      | AD1P_3 | A-Path RSDS data signal  | 58      | GM5    | Gamma Power supply          |
| 19      | AD1M_3 | A-Path RSDS data signal  | 59      | GM4    | Gamma Power supply          |
| 20      | AD0P_3 | A-Path RSDS data signal  | 60      | GM3    | Gamma Power supply          |
| 21      | AD0M_3 | A-Path RSDS data signal  | 61      | N.C.   | No connection               |
| 22      | BD1P_2 | B-Path RSDS data signal  | 62      | GM1    | Gamma Power supply          |
| 23      | BD1M_2 | B-Path RSDS data signal  | 63      | GND    | Ground                      |
| 24      | BD0P_2 | B-Path RSDS data signal  | 64      | TP1    | RSDS data latch             |
| 25      | BD0M_2 | B-Path RSDS data signal  | 65      | CKV    | Scan driver clock           |
| 26      | AD1P_2 | A-Path RSDS data signal  | 66      | OE1    | Scan driver output enable 1 |
| 27      | AD1M_2 | A-Path RSDS data signal  | 67      | OE2    | Scan driver output enable 2 |
| 28      | GND    | Ground                   | 68      | STV    | Scan driver start pulse     |
| 29      | A_CLKP | A-Path Data driver clock | 69      | GND    | Ground                      |
| 30      | A_CLKM | A-Path Data driver clock | 70      | VDD    | Logic Power supply          |
| 31      | GND    | Ground                   | 71      | VDD    | Logic Power supply          |
| 32      | AD0P_2 | A-Path RSDS data signal  | 72      | VDDA   | Driver Power supply         |
| 33      | AD0M_2 | A-Path RSDS data signal  | 73      | VDDA   | Driver Power supply         |
| 34      | BD1P_1 | B-Path RSDS data signal  | 74      | VCM    | VCM Power supply            |
| 35      | BD1M_1 | B-Path RSDS data signal  | 75      | VCM    | VCM Power supply            |
| 36      | BD0P_1 | B-Path RSDS data signal  | 76      | VGL    | Driver Power supply         |
| 37      | BD0M_1 | B-Path RSDS data signal  | 77      | VGL    | Driver Power supply         |
| 38      | AD1P_1 | A-Path RSDS data signal  | 78      | VGH    | Driver Power supply         |
| 39      | AD1M_1 | A-Path RSDS data signal  | 79      | VGH    | Driver Power supply         |
| 40      | AD0P_1 | A-Path RSDS data signal  | 80      | GND    | Ground                      |

**CN2(XR) Connector Pin Assignment**

| Pin No. | Symbol | Description                 | Pin No. | Symbol | Description             |
|---------|--------|-----------------------------|---------|--------|-------------------------|
| 1       | GND    | Ground                      | 41      | BD1M_6 | B-Path RSDS data signal |
| 2       | VGH    | Driver Power supply         | 42      | BD0P_6 | B-Path RSDS data signal |
| 3       | VGH    | Driver Power supply         | 43      | BD0M_6 | B-Path RSDS data signal |
| 4       | VGL    | Driver Power supply         | 44      | AD1P_6 | A-Path RSDS data signal |
| 5       | VGL    | Driver Power supply         | 45      | AD1M_6 | A-Path RSDS data signal |
| 6       | VCM    | VCM Power supply            | 46      | AD0P_6 | A-Path RSDS data signal |
| 7       | VCM    | VCM Power supply            | 47      | AD0M_6 | A-Path RSDS data signal |
| 8       | VDDA   | Driver Power supply         | 48      | BD1P_5 | B-Path RSDS data signal |
| 9       | VDDA   | Driver Power supply         | 49      | BD1M_5 | B-Path RSDS data signal |
| 10      | VDD    | Logic Power supply          | 50      | BD0P_5 | B-Path RSDS data signal |
| 11      | VDD    | Logic Power supply          | 51      | BD0M_5 | B-Path RSDS data signal |
| 12      | GND    | Ground                      | 52      | GND    | Ground                  |
| 13      | VSCM   | VSCM Power supply           | 53      | GM20   | Gamma Power supply      |
| 14      | TP1    | RSDS data latch             | 54      | N.C.   | No connection           |
| 15      | STV    | Scan driver start pulse     | 55      | GM18   | Gamma Power supply      |
| 16      | CKV    | Scan driver clock           | 56      | GM17   | Gamma Power supply      |
| 17      | OE2    | Scan driver output enable 2 | 57      | GM16   | Gamma Power supply      |
| 18      | OE1    | Scan driver output enable 1 | 58      | GM15   | Gamma Power supply      |
| 19      | GND    | Ground                      | 59      | GM14   | Gamma Power supply      |
| 20      | BD1P_8 | B-Path RSDS data signal     | 60      | GM13   | Gamma Power supply      |
| 21      | BD1M_8 | B-Path RSDS data signal     | 61      | GM12   | Gamma Power supply      |
| 22      | BD0P_8 | B-Path RSDS data signal     | 62      | GM11   | Gamma Power supply      |
| 23      | BD0M_8 | B-Path RSDS data signal     | 63      | GM10   | Gamma Power supply      |
| 24      | AD1P_8 | A-Path RSDS data signal     | 64      | GM9    | Gamma Power supply      |
| 25      | AD1M_8 | A-Path RSDS data signal     | 65      | GM8    | Gamma Power supply      |
| 26      | AD0P_8 | A-Path RSDS data signal     | 66      | GM7    | Gamma Power supply      |
| 27      | AD0M_8 | A-Path RSDS data signal     | 67      | GM6    | Gamma Power supply      |
| 28      | GND    | Ground                      | 68      | GM5    | Gamma Power supply      |
| 29      | C_CLKP | Data driver clock           | 69      | GM4    | Gamma Power supply      |
| 30      | C_CLKM | Data driver clock           | 70      | GM3    | Gamma Power supply      |
| 31      | GND    | Ground                      | 71      | N.C.   | No connection           |
| 32      | BD1P_7 | B-Path RSDS data signal     | 72      | GM1    | Gamma Power supply      |
| 33      | BD1M_7 | B-Path RSDS data signal     | 73      | GND    | Ground                  |
| 34      | BD0P_7 | B-Path RSDS data signal     | 74      | AD1P_5 | A-Path RSDS data signal |
| 35      | BD0M_7 | B-Path RSDS data signal     | 75      | AD1M_5 | A-Path RSDS data signal |
| 36      | AD1P_7 | A-Path RSDS data signal     | 76      | D_CLKP | Data driver clock       |
| 37      | AD1M_7 | A-Path RSDS data signal     | 77      | D_CLKM | Data driver clock       |
| 38      | AD0P_7 | A-Path RSDS data signal     | 78      | AD0P_5 | A-Path RSDS data signal |
| 39      | AD0M_7 | A-Path RSDS data signal     | 79      | AD0M_5 | A-Path RSDS data signal |
| 40      | BD1P_6 | B-Path RSDS data signal     | 80      | GND    | Ground                  |

Note (1) CN1、CN2 Connector Part No.: FH31H-80S-0.5SH(06), Hirose

## 6. OPTICAL CHARACTERISTICS

### 6.1 TEST CONDITIONS

| Item                             | Symbol                                                        | Value   | Unit |
|----------------------------------|---------------------------------------------------------------|---------|------|
| Ambient Temperature              | Ta                                                            | 25±2    | °C   |
| Ambient Humidity                 | Ha                                                            | 50±10   | %RH  |
| Supply Voltage                   | V <sub>CC</sub>                                               | 12      | V    |
| Input Signal                     | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |         |      |
| Lamp Current                     | I <sub>L</sub>                                                | 9.3±0.5 | mA   |
| Oscillating Frequency (Inverter) | F <sub>W</sub>                                                | 40±3    | KHz  |
| Vertical Frame Rate              | Fr                                                            | 60      | Hz   |

### 6.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (7).

| Item                 |            | Symbol        | Condition                                                                     | Min.       | Typ.    | Max.       | Unit | Note     |
|----------------------|------------|---------------|-------------------------------------------------------------------------------|------------|---------|------------|------|----------|
| Color Chromaticity   | Red        | Rcx           | $\theta_x=0^\circ, \theta_y=0^\circ$<br>CS-1000T<br>Standard light source “C” | Typ - 0.03 | (0.643) | Typ + 0.03 | -    | (1),(6)  |
|                      |            | Rcy           |                                                                               |            | (0.332) |            | -    |          |
|                      | Green      | Gcx           |                                                                               |            | (0.272) |            | -    |          |
|                      |            | Gcy           |                                                                               |            | (0.599) |            | -    |          |
|                      | Blue       | Bcx           |                                                                               |            | (0.152) |            | -    |          |
|                      |            | Bcy           |                                                                               |            | (0.067) |            | -    |          |
|                      | White      | Wcx           |                                                                               |            | (0.285) |            | -    |          |
|                      |            | Wcy           |                                                                               |            | (0.295) |            | -    |          |
| Center Transmittance |            | T%            | $\theta_x=0^\circ, \theta_y=0^\circ$                                          | -          | (4.5)   |            | %    | (2), (8) |
| Contrast Ratio       |            | CR            | With CMO Module                                                               | (3000)     | (4000)  |            | -    | (2), (4) |
| Response Time        |            | Gray to gray  | $\theta_x=0^\circ, \theta_y=0^\circ$<br>With CMO Module<br>@60Hz              | -          | (4.5)   | (9)        | ms   | (5)      |
| White Variation      |            | $\delta W$    | $\theta_x=0^\circ, \theta_y=0^\circ$<br>With CMO Module                       | -          | -       | (1.3)      |      | (2), (7) |
| Viewing Angle        | Horizontal | $\theta_{x+}$ | CR $\geq$ 20<br>With CMO Module                                               | (80)       | (88)    | -          | Deg. | (2), (3) |
|                      |            | $\theta_{x-}$ |                                                                               | (80)       | (88)    | -          |      |          |
|                      | Vertical   | $\theta_{y+}$ |                                                                               | (80)       | (88)    | -          |      |          |
|                      |            | $\theta_{y-}$ |                                                                               | (80)       | (88)    | -          |      |          |

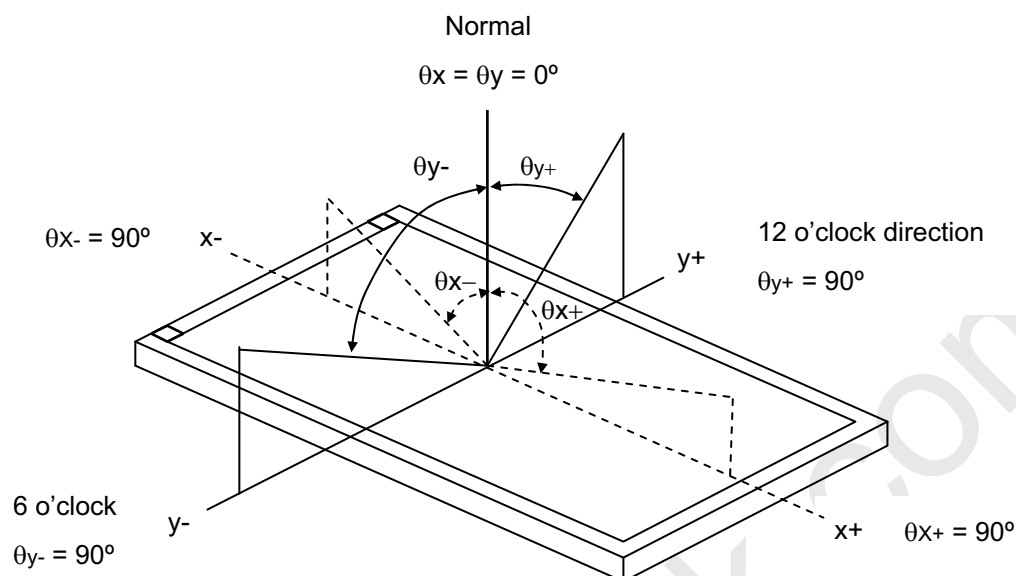
Note (1) Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrums. W, R, G, B are with signal input. BLU(for V420H1-L15) is supplied by CMO.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

Note (2) Light source is the BLU which is supplied by CMO and driving voltages are based on suitable gamma voltages.

Note (3) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):

Viewing angles are measured by EZ-Contrast 160R (Eldim)

**Note (4) Definition of Contrast Ratio (CR):**

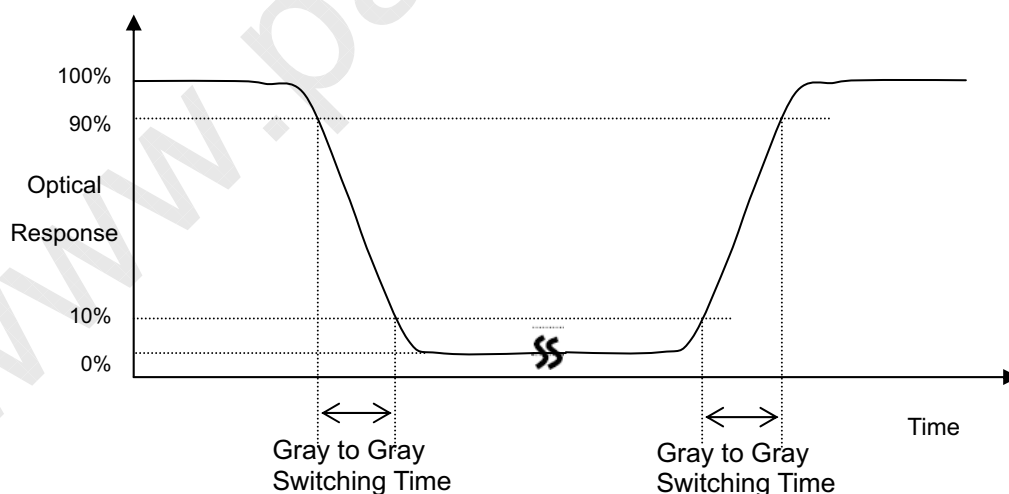
The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

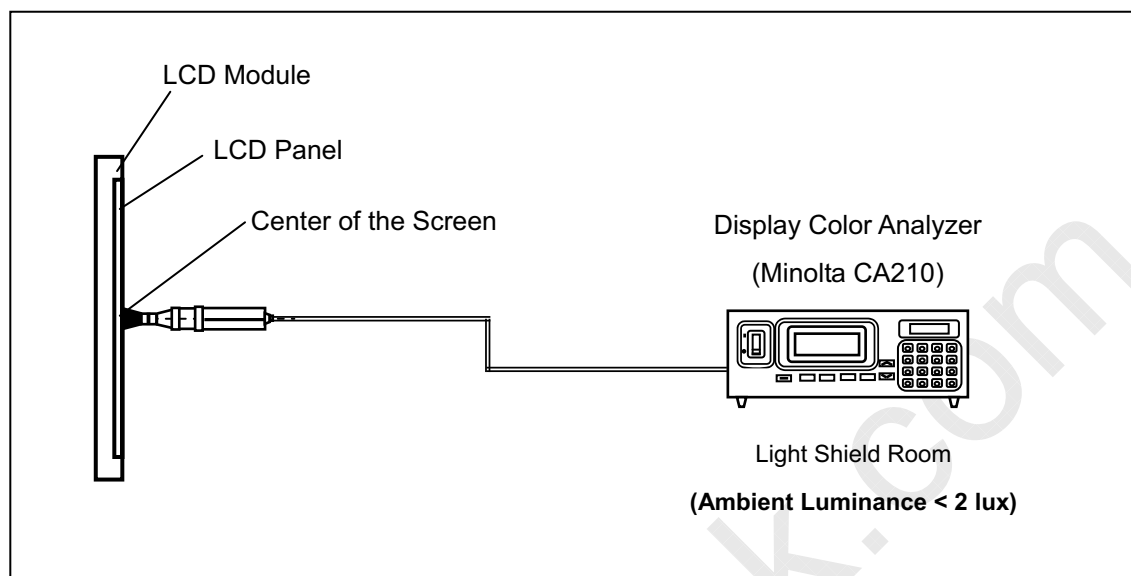
L0: Luminance of gray level 0

CR = CR (1), where CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (8).

**Note (5) Definition of Gray to Gray Switching Time:****Note (6) Measurement Setup:**

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed

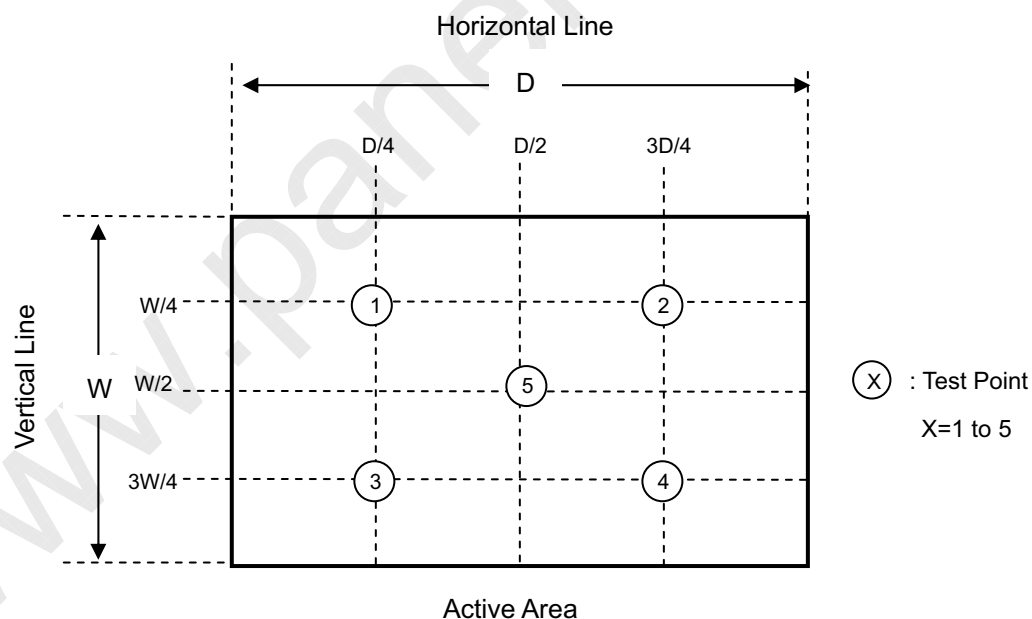
after lighting backlight for 1 hour in a windless room.



Note (7) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \text{Maximum} [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum} [L(1), L(2), L(3), L(4), L(5)]$$



Note (8) Definition of Transmittance (T%):

Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

## 7. PRECAUTIONS

### 7.1 ASSEMBLY AND HANDLING PRECAUTIONS

- [ 1 ] Do not apply rough force such as bending or twisting to the module during assembly.
- [ 2 ] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [ 3 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- [ 4 ] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- [ 5 ] Do not plug in or pull out the I/F connector while the module is in operation.
- [ 6 ] Do not disassemble the module.
- [ 7 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- [ 8 ] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [ 9 ] When storing modules as spares for a long time, the following precaution is necessary.
  - [ 9.1 ] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
  - [ 9.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [ 10 ] When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

### 7.2 SAFETY PRECAUTIONS

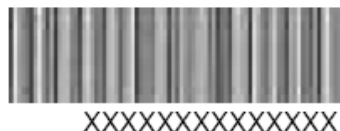
- [ 1 ] The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.
- [ 2 ] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- [ 3 ] After the module's end of life, it is not harmful in case of normal operation and storage.

## 8. DEFINITION OF LABELS

### 8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMO internal control.

V470H2-PH1



### 8.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.

|                                                                                                              |      |
|--------------------------------------------------------------------------------------------------------------|------|
| <br>CHI MEI OPTOELECTRONICS | RoHS |
| PO.NO. _____                                                                                                 |      |
| Part ID. _____                                                                                               |      |
| Model Name _____                                                                                             |      |
| Carton ID. _____ Quantities _____                                                                            |      |

- (a) Model Name: V470H2-PH1
- (b) Carton ID: CMO internal control
- (c) Quantities: 8 pcs



## 9. Packaging

### 9.1 packing specifications

- (1) 8 LCD TV Panels / 1 Box
- (2) Box dimensions : 1238 (L) X 842 (W) X 240 (H)
- (3) Weight : approximately 38Kg (8 panels per box)

### 9.2 packing Method

Figures 10-1 and 10-2 are the packing method

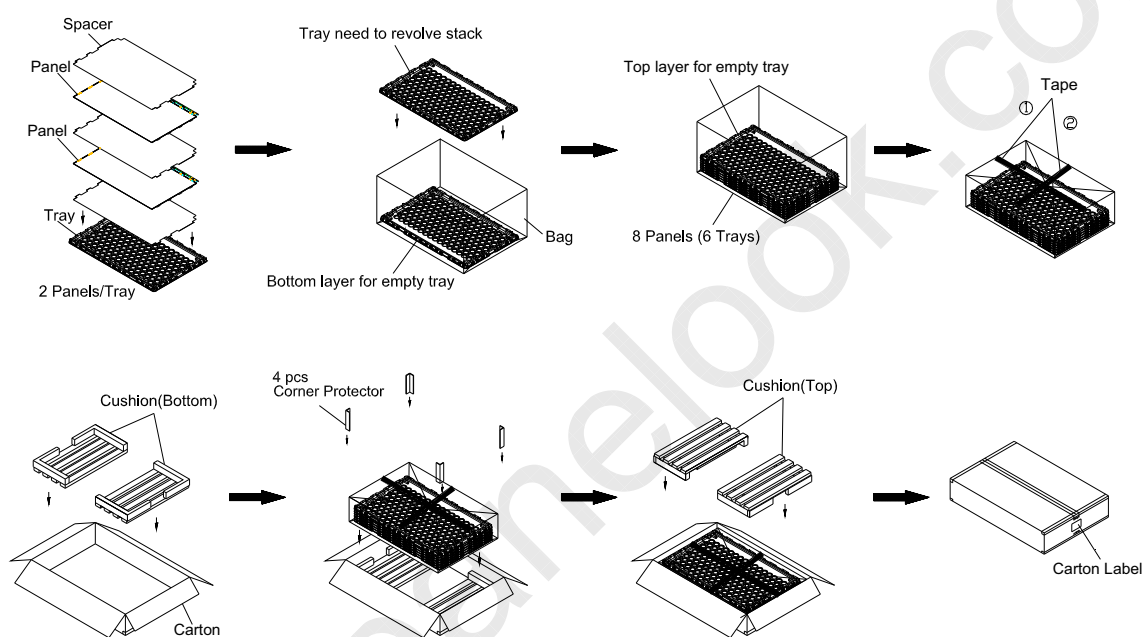
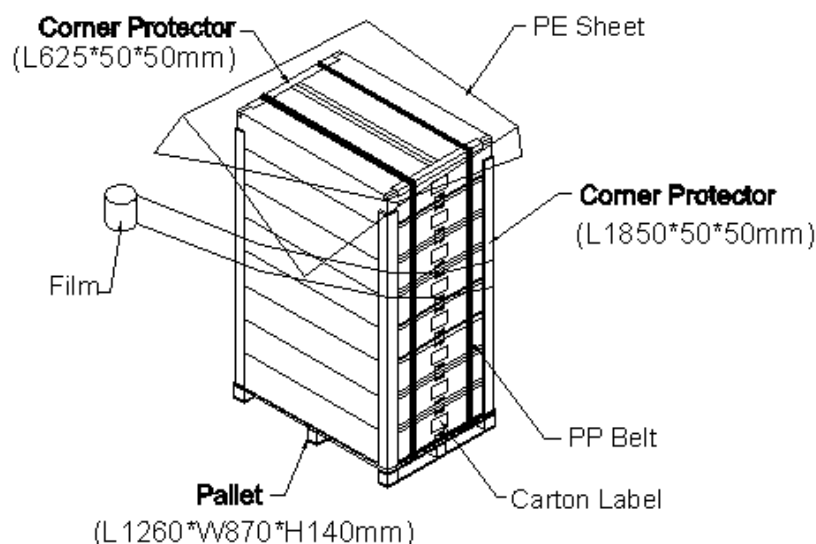


Figure.10-1 packing method

## Sea & Land Transportation

Gross: 319kg



## Air Transportation

Figure.10-2 packing method

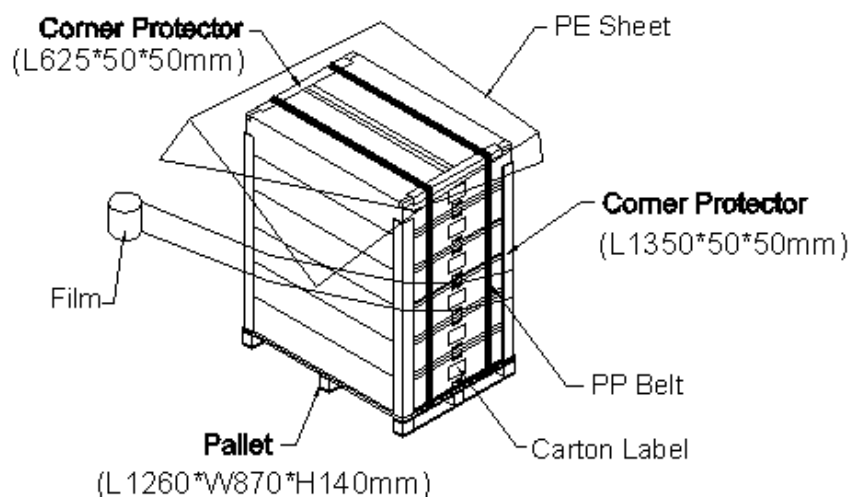


Figure.10-2 packing method

**CHI MEI**  
OPTOELECTRONICS CORP.

Issue Date: Jul.21.2009

Model No.: V470H2-PH1

**Preliminary**

## 10. MECHANICAL CHARACTERISTICS

